

REMARKS

At the outset, applicant wishes to thank Examiner C. Lynne Anderson and Supervisory Primary Examiner Weilun Lo for the courtesies extended during the personal interview held on November 6, 2003 with the undersigned attorney. The Examiners' careful attention to the application on that occasion was sincerely appreciated.

Claims 19 and 20 were rejected under 35 USC §112, second paragraph, for indefiniteness. The Official Action states that "the metal ion" in line 2 of claim 19 and "the crosslinking agent" on line 2 of claim 20 lack antecedent basis. By the present amendment, it will be seen that proper and direct antecedent basis has been provided by changing these respective expressions to read --the polyvalent metal ion--, and --the cationic crosslinking agent--.

Claims 13-17 and 21-24 were rejected under 35 USC §102(b) as being anticipated by HARADA et al. 5,382,610.

Claims 18-20 were rejected under 35 USC §103(a) as being unpatentable over HARADA et al. in view of JOHNSON et al. 5,684,106. The Official Action states that the HARADA et al. reference discloses all aspects of the claimed invention with the exception of the cationic crosslinking agent comprising a polyvalent metal ion. The secondary reference to JOHNSON et al. is relied upon as disclosing such a feature in column 4, lines

60-63. It is concluded that it would have been obvious to one of ordinary skill in the art to have used a polyvalent metal ion as the cationic crosslinking agent, as taught by JOHNSON et al., in the absorbent structure of HARADA et al.

Reconsideration of the above rejections is respectfully requested for the following reasons.

As was explained during the interview, a principal object of the present invention is to solve the problem of gel blocking in absorbent structures containing high amounts of superabsorbent material (more than 50%). A major problem in the use of superabsorbent materials in absorbent structures is that they cause gel blocking. The gel blocking phenomenon means that the superabsorbent material when wetted forms a gel which blocks the pores in the fiber structure and consequently deteriorates the liquid transport away from the wetting area to the other parts of the absorbent structure. This gel blocking causes significant problems especially at repeated wettings, since by then the already swollen superabsorbent blocks the new liquid from being received and spread in the absorbent structure. This problem is accentuated when the absorbent structure contains high concentrations of superabsorbent material. In order to provide an absorbent article that is comfortable and discrete to wear, it is desirable that the article be thin. In order to maintain a

high liquid absorption capacity, such thin products often have a high amount of superabsorbent material.

Applicant has discovered that ionically crosslinked superabsorbents used in high amounts (at least 50 wt%) in absorbent structures lead to improved properties of the structure with respect to liquid acquisition capacity, and distribution capacity at repeated wettings, as compared to a superabsorbent which is only covalently crosslinked. This discovery is substantiated by the comparative tests presented in the original specification, and depicted in the drawings.

The reason for these improved results is believed to be that a superabsorbent, which is surface crosslinked or homogeneously crosslinked with an ion-binding crosslinking agent maintains its gel stability after swelling in a better fashion, since the ionic bonds can be redistributed and regenerated as the polymers swell, which a covalent crosslinking bond simply cannot do. When a superabsorbent that is covalently crosslinked absorbs liquid, the covalent crosslinking bonds are gradually broken, and consequently the superabsorbent gradually loses its gel stability as it swells, which leads to gel blocking, as is explained in the third full paragraph on page 6 of the specification.

In the comparative tests described in the specification, the superabsorbent was used in particle form, such as powders, grains or granules. Consequently, commensurate with

these test conditions, the superabsorbent material recited in independent claim 13 is limited to this physical characteristic.

It should be pointed out that the superabsorbent material according to the present invention can be either only ionically crosslinked, or both covalently and ionically crosslinked, as is indicated in the last paragraph of page 6 of the specification. Thus, it is clear that the superabsorbent material is **initially** crosslinked by ionic bonds with an ionic crosslinking agent. The ionic crosslinking can either be on the surface of the superabsorbent particles, or homogeneously throughout the entire structure of the superabsorbent.

The primary reference to HARADA et al. discloses a superabsorbent material having acid groups, such as carboxy groups, on its surface. A preferred superabsorbent material is for example crosslinked polyacrylate. The crosslinking is a covalent crosslinking, as is explained in column 4, lines 24-30; column 8, lines 54-58; column 9, lines 43-63; and column 10, lines 43-46. The covalently crosslinked superabsorbent material is **subsequently** treated with a cationic high-molecular compound, for example a polyamidopolyamine epihalohydrine resin, as is indicated in column 4, lines 36-42; and column 5, lines 22-24. This high-molecular compound should be capable of making an ionic bond by reacting with the carboxy group of the crosslinked superabsorbent material as is indicated in column 5, lines 34-37

and column 10, lines 51-54. However, the purpose of reacting the superabsorbent material with the cationic high-molecular compound is that the latter acts like a binder of the superabsorbent particles with the cellulose fibers, so that the particles are firmly set with the cellulose fibers via the cationic high-molecular compound as is indicated in column 10, lines 33-38.

Thus, the purpose of the high-molecular compound in HARADA et al. is not to act as a crosslinking agent, and the ionic bonding between the superabsorbent material and the compound referred to is only intended to bond these two polymeric compounds together. The cationic high-molecular compound should further be able to react with the cellulose fibers in a fibrous structure to bond the superabsorbent particles firmly to the cellulose fibers via the cationic high-molecular compound. Crosslinking of the superabsorbent material according to HARADA et al. must **initially** take place with covalent crosslinkers as is indicated in column 9, lines 43-63.

During the interview, it was urged that the sequence of addition of crosslinking agent is significant and critical in HARADA et al., as the patentees state in the paragraph bridging columns 9 and 10 that if a covalent bond-crosslinked layer is set after an ionic bond layer, or if both of the layers are simultaneously set, the effects of their invention are not obtained. Moreover, if only the ionic bond layer is set without

setting a covalent bond-crosslinked layer, or if only the covalent bond-crosslinked layer is set without setting an ionic bond layer, the effects of their invention are similarly not obtained.

As is reflected in the Examiner Interview Summary Record (PTOL-413), in order to advance prosecution of this application, it was proposed to incorporate the subject matter of claim 18 into independent claims 13 and 24, and further specify that the superabsorbent material is **initially** crosslinked by ionic bonds. The Examiners agreed that the HARADA et al. primary reference discloses initially covalently crosslinking, and teaches away from initially ionic crosslinking in the paragraph bridging columns 9 and 10.

The secondary reference to JOHNSON et al. fails to remedy the fundamental shortcomings of the HARADA et al. reference, as it merely discloses the use of polyvalent metal ions for ionic crosslinking. As was indicated during the interview, although covalent crosslinking is by far the most common, applicant is not the first one to have discovered ionic crosslinking of superabsorbent materials. However, the herein-claimed invention calls for an absorbent structure comprising a combination of a porous material and a superabsorbent material, wherein the absorbent structure contains at least 50% by weight of superabsorbent material, based on the total weight of the

structure in dry condition in at least one area thereof in which a superabsorbent material is distributed. In addition, the superabsorbent material is in the form of a powder, grains or granules, and is initially crosslinked by ionic bonds with an ionic crosslinking agent comprising a polyvalent metal ion.

It is respectfully submitted that when considering the applied references collectively, there would be no reason, motivation or suggestion to combine their respective teachings in the manner necessary to achieve the herein-claimed invention. Indeed, as was indicated above, the HARADA et al. reference requires a mandatory sequence of initially covalently crosslinking, followed by ionic crosslinking.

In view of the recent interview, the present amendment and the foregoing remarks, it is believed that this application has been placed in condition for allowance. Reconsideration and allowance are accordingly earnestly solicited.

In the event that there are any questions relating to this amendment or to the application in general, it would be appreciated if the Examiner would telephone the undersigned attorney concerning such questions so that the prosecution of this application may be expedited.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

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overpayment to Deposit Account No. 25-0120 for any additional
fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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